

PUGET SOUND ENVIRONMENTAL LEARNING CENTER

CASCADIA REGION GREEN BUILDING COUNCIL



FLOOR SPACE: 70,574 ft²

BUDGET: \$33 million (including site infrastructure)

BUILDING POPULATION: Approx. 40 staff, 110 students/chaperones

CONSTRUCTION DATES: 2000-2002

OWNER: Puget Sound Environmental Learning Center

ARCHITECT: Mithun Architects + Designers + Planners

LANDSCAPE ARCHITECT: The Berger Partnership

MASTER PLANNING: Bill Isley

STRUCTURAL ENGINEER: Skilling Ward Magnusson Barkshire

ELECTRICAL ENGINEER: Cross Engineers

MECHANICAL ENGINEER: Keen Engineering

ALTERNATIVE WATER ENGINEER: 2020 Engineering Inc.

SOLAR CONSULTANT: Western Sun

GENERAL CONTRACTORS: RAFN Construction, Drury Construction, Doug Woodside

PROJECT NOTES

SITE AND WATER

- **Mapping:** Detailed GIS mapping used to minimize site impact.
- **Vegetation:** Native plantings used throughout to provide wildlife habitat and minimize watering needs.
- **Water consumption:** Low-flow fixtures conserve or eliminate water use. For example, waterless urinals require no water for flushing.
- **Wastewater:** On-site treatment systems created for all wastewater, including a Living Machine™ to treat grey-water and black-water for flushing toilets and irrigation. Constructed wetlands treat the wastewater at the lodges and graduate student cabins.
- **Stormwater:** Partial rainwater collection system at educational buildings used for student education, boot washing and local irrigation.

ENERGY AND ATMOSPHERE

- **Planning:** TAS modeling used to locate windows and shape building for optimal energy performance.
- **HVAC:** Buildings naturally ventilated, needing no chillers or cooling ductwork. Spot ventilation employed for bathrooms, kitchen and auditorium.
- **Insulation:** Walls are all insulated to R-19; roofs to R-40.
- **Solar heat:** Heat-dependent buildings oriented east-to-west for maximum solar gain, with overhangs for southside protection.
- **Heating:** Primary buildings heated with high-efficiency in-floor hydronic heating.
- **Solar water heat:** Solar water heaters used for dining hall and three lodges.

- **Photovoltaics:** A 23 KW PV array powers 50% of the classroom energy needs at the Learning Studio building, and small PV panels power building exhaust fans.
- **Shading:** Operable awnings provide extensive shading in dining and office spaces.
- **Lighting:** Efficient T-5 fluorescent lamps installed in offices and classrooms.
- **Transportation:** A natural gas pump will be installed near the maintenance building for use by natural gas-powered vehicles. PSEL's first vehicle is a hybrid Toyota Prius.

MATERIALS AND RESOURCES

- **Concrete:** 50% fly ash content in all concrete.
- **Lumber:** Over 57% of all wood products FSC-certified. All wood cleared from site milled for exterior sheathing and interior trim.
- **Reclaiming:** Salvaged lumber used for four primary flooring areas. Site-salvaged timbers crafted by local artisans for railings and guardrails.

INDOOR ENVIRONMENTAL QUALITY

- **Day-lighting:** All building footprints oriented to optimize natural light.
- **Interior light:** Lighting controls designed to maximize natural light use over electrical.
- **Finishing:** Building structures designed to eliminate added interior finishes. Low-emission stains, paints, sealants and adhesives used throughout.
- **Air:** CO₂ monitors in primary spaces monitor air quality.

PUGET SOUND ENVIRONMENTAL LEARNING CENTER

In 1998, Mithun Architects sat down with a new client to program and design an outdoor education facility on Bainbridge Island. The job: building a campus on a 255-acre parcel of land that could provide quality education to 4,000 schoolchildren each year—a challenging proposition for anyone.

Using Debbi Brainerd's intensive research of many environmental learning centers around the country as a baseline, Mithun and PSEL staff developed a program with goals that highlight the four E's:

enhancing the Environment, enhancing the children's Experience, using the building and landscape as Education and meeting these goals with maximum Economy. The team also established goals of achieving a LEED™ silver rating (v 1.0), and maximizing the visibility and educational opportunities of all sustainable strategies.



"An amazing mission statement, client and team of consultants—what more could you ask for? The ability to transform an ecologically diverse piece of land in our community into an environmental education opportunity for children has been a thoughtful, complex and rewarding journey for Mithun."

—Mithun Principal Bert Gregory, AIA

CAMPUS PLANNING

First came the task of determining the basic layout of the campus. To do this, the project teams used aerial photographs of the property to build maps of the site's characteristics and evolution. Through this process, the team could discern which areas had been the most relatively undisturbed by logging and other activities—these portions would be the best for the children's field excursions.

To further plan the basic campus design, the Mithun team spent the night camping out on the Bainbridge Island property, experiencing it as so many future school children would. The PSEL staff, UW Landscape Architecture School and the design team worked with groups of schoolchildren in a series of workshops designed to elicit children's ideas, sketches and aspirations for the project.

"This is not Paul and Debbi's project. We want it to be the community's project. We knew we needed to connect with people on the island and in Seattle, and with kids and teachers, but little did we realize that three years later we would still be doing it almost every weekend and that the number of people who contributed ideas would be in the thousands."

—PSEL Cofounder Paul Brainerd

SETTING UP FOR THE SUN

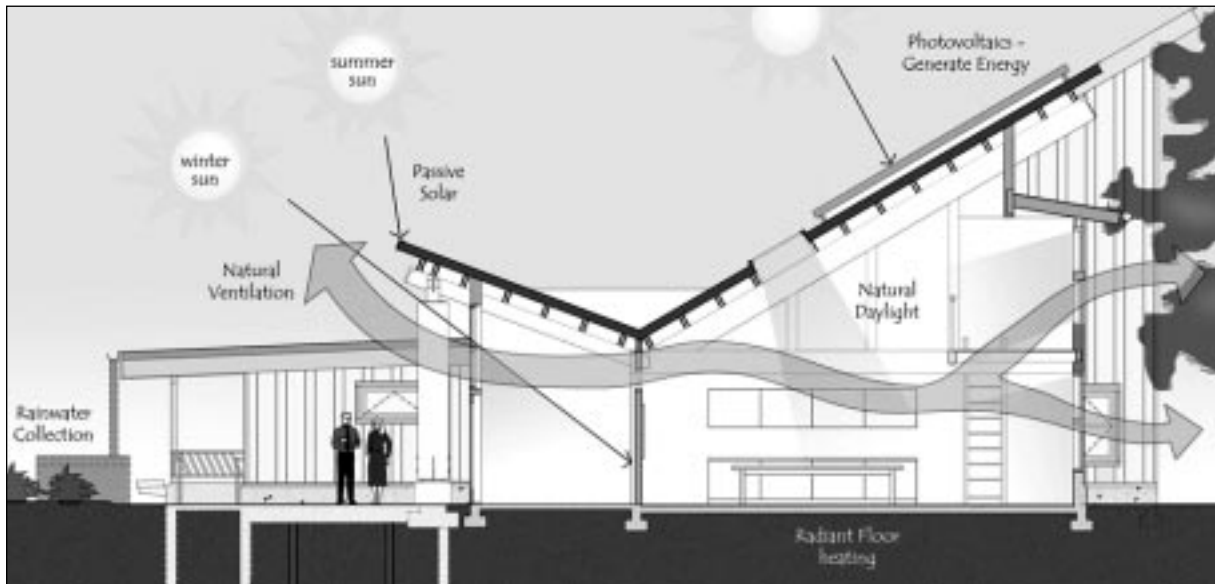
Then came the process of orienting and designing the buildings to utilize the sun for energy and natural lighting. Keen Engineering conducted sophisticated thermal modeling to determine how the buildings could be shaped and glazed to avoid using air conditioning and minimize heating. Two of the buildings were designed with butterfly roofs to optimize solar gain to the south while providing an area for future and current installation of solar water heaters or photovoltaic panels. These roof sections also enhanced natural ventilation in the two buildings.

Mithun also worked with Western Sun to develop an overall solar strategy and pricing structure. Finally, Schott-APC worked with the design team to design and build a 23-kilowatt photovoltaic array at the learning studios.

NOT WASTING WASTEWATER

Mithun and 2020 Engineering worked together to develop a strategy that would enable the PSEL to process all wastewater on-site, requiring no connection to a municipal sewage system. Two different systems were used, a Living Machine™ at the educational core, and a subsurface flow constructed wetland at the lodges and graduate student housing.

A Living Machine™ utilizes nature's own filtration capacity to treat grey-water (from showers and washbasins) and black-water (from toilets) for reuse. The wastewater is broken down by filtration, aerobic action, and aquatic plants, microorganisms and snails, and eventually used again for subsurface irrigation and flushing toilets. This process serves as one of the pillars of the educational program, since it teaches children about nature's ability to recycle and renew itself.



BUILDING SMART

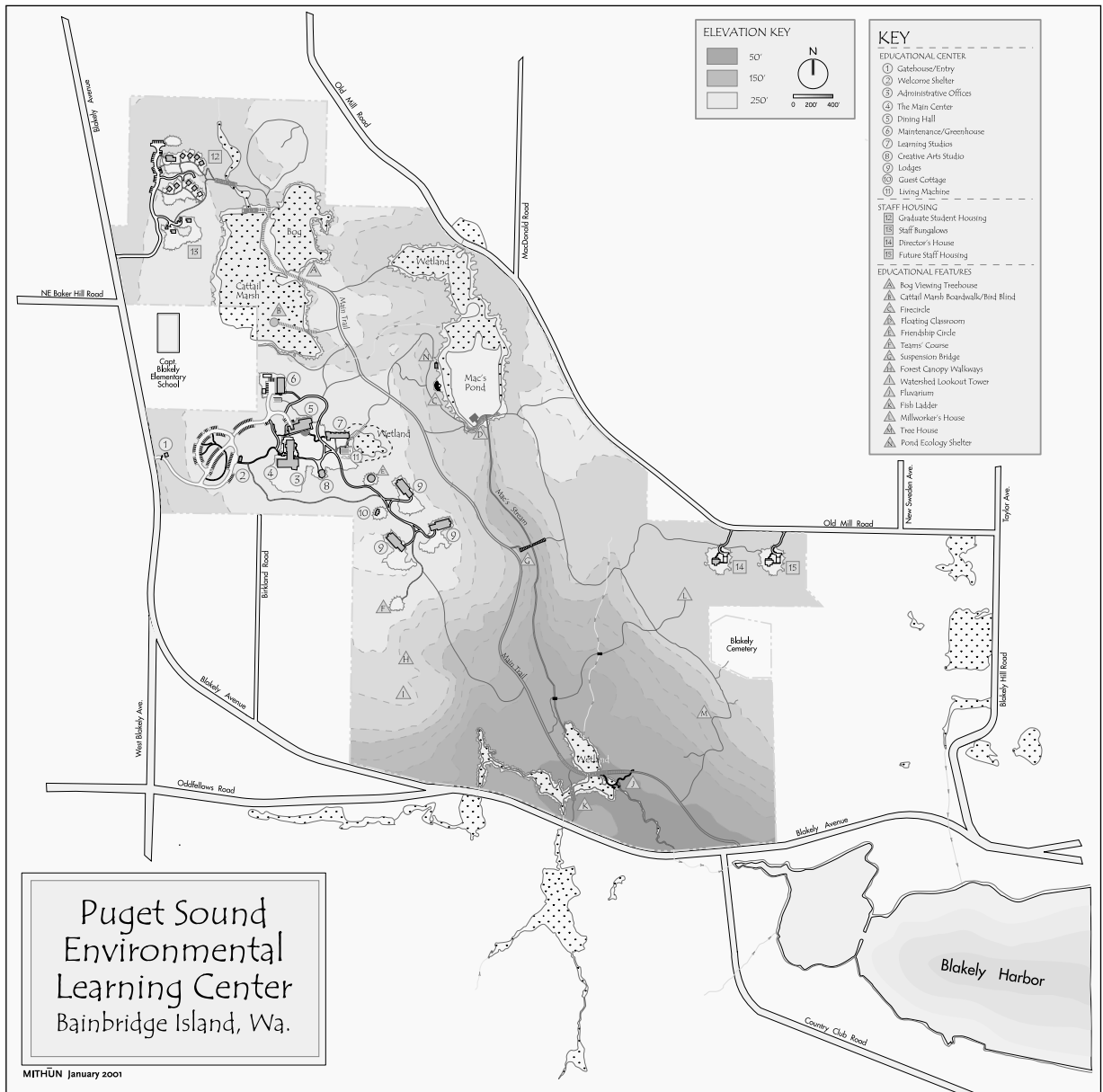
Keeping with the spirit of resource recycling, the construction crew at RAFN maintained an on-site recycling rate of 96%, diverting the vast majority of building “waste” from the landfill. All of the plant life cleared from the site was reused on the project in some way. Felled trees were milled, dried and used as exterior sheathing and interior trim.

Local artisans crafted interior railings, guardrails and tables out of wood salvaged from the property. Cleared brush and timber were chipped and mulched for trail cover and other landscaping purposes. Also, a 92-foot Douglas fir beam, believed to be milled at Port Blakely in the late 1800s, spans the length of the large auditorium and interpretive center.

The builders used over 50% FSC-certified wood, which is guaranteed to come from well-managed forests. Similarly, all concrete used on-site has a fly ash content of 50%, creating significantly less CO₂ from cement processing.

While these measures are indeed impressive, the project team also took care to use materials that would be especially interesting to children and other guests for their ingenuity. For example, one building will feature a countertop made of recycled yogurt containers. Toilet partitions are made of recycled plastic, and recycled-glass wall tiles are found throughout. Artists have been commissioned to design artwork around environmental themes ranging from Buster Simpson's Mobius-strip saw blade rotating around the 92-foot beam, to Peter Requiam's life-size, heroic figure—a steel scale allowing children to measure food waste.

The bottom line is that this is one investment that is sure to pay for itself. The children educated at PSEL will be turned on to all of the environmental ingenuity around them, and will eventually go on to dream up innovations we can't currently imagine. This is the vision that drives the Brainerds, the PSEL staff and the project team.



AWARDS AND HONORS

2002 WHAT MAKES IT GREEN? SEATTLE AIA

2001 CRAFTSMANSHIP AWARD, PUGET SOUND CHAPTER OF THE CSI

2001 TEN SHADES OF GREEN, CASCADIA REGION, PORTLAND AIA AND OFFICE OF SUSTAINABLE DEVELOPMENT

CASE STUDY SPONSORED BY:

